

REMARKS

The present application was filed on July 7, 2003 with claims 1 through 26. Claims 1 through 26 are presently pending in the above-identified patent application. Claims 1, 5, 14, and 18 are proposed to be amended herein.

5 In the Office Action, the Examiner rejected the specification under 35 U.S.C. 112, first paragraph, which requires the specification to be written in "full, clear, concise, and exact terms," and noted that the incorporation of 'essential' material in the specification by reference to an unpublished U S application, foreign application or patent, or to a publication is improper. The Examiner objected to the disclosure under 37 CFR 1.71, as being so incomprehensible as to almost preclude a reasonable search of the prior art by the Examiner. The Examiner also  
10 rejected claims 1-26 under 35 U.S.C. §101 because the claimed invention is directed to non-statutory subject matter, rejected claims 1-26 under 35 U.S.C. §112, first paragraph, as failing to comply with the enablement requirement, and rejected claims 1-26 under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject  
15 matter which applicant regards as the invention. The Examiner rejected claims 1-11 and 14-24 under 35 U.S.C. §102(b) as being anticipated by Alur et al. (United States Patent Number 6,324,496), and rejected claims 12, 13, 25, and 26 under 35 U.S.C. §103(a) as being unpatentable over Alur et al., and further in view of Alur et al., "Alternating-time Temporal Logic," Foundations of Computer Science, FOCS 1997, Proceedings of the 38<sup>th</sup> Annual Symposium, pp.  
20 100-107, hereinafter "Alur2."

Claims 1, 5, 14, and 18 have been amended to correct typographical errors

Section 112 Rejections

The specification was rejected under 35 U.S.C. 112, first paragraph, which requires the specification to be written in "full, clear, concise, and exact terms," and noted that  
25 the incorporation of 'essential' material in the specification by reference to an unpublished U.S. application, foreign application or patent, or to a publication is improper. The disclosure was objected to under 37 CFR 1.71, as being so incomprehensible as to almost preclude a reasonable search of the prior art by the Examiner. Claims 1-26 were rejected under 35 U.S.C. §112, first paragraph, as failing to comply with the enablement requirement, and under 35 U.S.C. §112,

second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Applicant has made every attempt to address all of the Examiner's concerns cited in the above rejections.

5           The specification was rejected under 35 U.S.C. 112, first paragraph, which requires the specification to be written in "full, clear, concise, and exact terms." In particular, the Examiner cited some examples of terms recited the specification that are alleged to be unclear, inexact, or verbose (page 2 of the present Office Action). The Examiner further asserts that "the description to explain on the meaning of these symbolic elements in terms of more  
10   decipherable and common phraseology is observed as being far inadequate for one skill in the art to comprehend the semantic or legend underlying or pertaining to those expressions." The Examiner asserts that the disclosure is marred with two main deficiencies: (i) the lack of consistency in accompanying each element of the equations with a decent legend or explanation therefore to put forth a rationale, and (ii) the disjoint relationship or non-connectivity between  
15   the equations mentioned.

Applicant notes that all new concepts disclosed in the specification have been defined in the specification. The remaining terms and concepts, e.g.,  $AX(p) \vee AX(\neg p)$ , are standard concepts in the art. The notation at the bottom of page 2 is standard notation in logic, as would be apparent to a person of ordinary skill in the art. More importantly, Applicant notes that  
20   the present disclosure is based on a paper, entitled "Abstraction for Branching Time Properties," which was reviewed by those skilled in the art and accepted at the premiere conference in the field (Computer Aided Verification (CAV 2003)).

Regarding the Examiner's assertion that the incorporation of 'essential' material in the specification by reference to an unpublished U.S. application, foreign application or  
25   patent, or to a publication is improper, Applicant notes that only non-essential material provided for background information has been incorporated by reference.

The Examiner further asserts that "the complex nature of the invention subject matter is not clearly, and properly put forth in the Specifications to enable one skill in the art to have sufficient basic grasp on any novel aspect being claimed," and that "there is not sufficient

consistency or unity in conveying of a rationale to support a common endeavor.” The Examiner asserts that the specification lacks in explaining the nature of often very uncommon logical/mathematical operators, e.g. “M X A.”

As noted above, the present disclosure is based on a paper, entitled “Abstraction for Branching Time Properties,” which was reviewed by those skilled in the art and accepted at the premiere conference in the field. Applicant also notes that the notation M X A (cross product of a program with automaton) is a standard operation, as would be well understood by a person of ordinary skill in the art.

Claims 1-26 were rejected under 35 U.S.C. §112, first paragraph, as failing to comply with the enablement requirement. In particular, the Examiner provided the following comments:

The Specification does not provide (a) teaching about a product of program M expressed as an automation f.

The Specifications fail to disclose any embodiment that actually generates such abstract set of reduced states in terms of an application or engineering-level programmatic product.

The disclosed invention does not sufficiently teach a product being formed from a program M and a time property f in order to convey that the time property f is being expressed by an automaton f (as recited).

The inventor does not appear to possess the cited limitation at the time the invention was made, namely teachings or explicit and substantial specifics about how an automaton is expressing one time property.

Claims 2-13 fail to provide (a) teaching as to how the recited abstract transitions and states can be enabled by means of application level implementation(s) to realize a useful set of result deemed statutory as per the USC §101 requirement.

Claim 14 does not convey that the recited abstract program can be obtained via any real-world application or implementing utility deemed substantial, tangible and specific as perceived from the Specifications in order for one person by reading the specification to make use of the content therein to realize some useful application result as set forth above.

Further against claim 14, the invention does not teach a product being formed from a time property f being expressed as an automaton. The inventor does not appear to possess this f property expressed as automaton f at the time the invention was made.

Regarding the Examiner's assertion that the Specifications does not provide a teaching about a product of program M expressed as an automation f, and that the Specifications fail to disclose any embodiment that actually generates such abstract set of reduced states in terms of an application or engineering-level programmatic product, Applicant notes that such teachings and embodiments are disclosed on page 6, line 13, to page 8, line 3, of the present disclosure.

Regarding the Examiner's assertion that the inventor does not appear to possess the cited limitation at the time the invention was made, namely teachings or explicit and substantial specifics about how an automaton is expressing one time property, Applicant notes that this subject is addressed at page 6, line 13, to page 10, line 20, of the present disclosure.

The Examiner also asserts that claims 2-13 fail to provide (a) teaching as to how the recited abstract transitions and states can be enabled by means of application level implementation(s) to realize a useful set of result deemed statutory as per the USC §101 requirement, and that claim 14 does not convey that the recited abstract program can be obtained via any real-world application or implementing utility deemed substantial, tangible and specific as perceived from the Specifications in order for one person by reading the specification to make use of the content therein to realize some useful application result as set forth above. Applicant notes that, in light of the present specification and well known techniques in the art, a person of ordinary skill in the art would be able to implement an application level system to perform the transitions and states recited in claims 2-13

Claims 1-26 were also rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In particular, the Examiner provided the following comments:

Claim 1 recites 'forming a product of... M and said branching... property f, expressed as an automaton f'. There is inconsistency in more than one object being represented by a same 'f' and the Specifications does not seem to be consistent with this nomenclature.

Claim 5 recites S', S(bar) and 'X' and only S and Q are explained leaving out S(bar) and 'X'.

Claim 6 does not provide (an) explanation of the symbols  $\langle a \rangle_{q_1}$  and of  $\delta(q, true)$  and of the 'V' symbol.

Claims 7-9 recite symbols for which only a few are provided with some definition

Claims 10-11 recite an acronym for which there is no definition.

Regarding the Examiner's assertion that claim 1 recites 'forming a product of... M and said branching... property f, expressed as an automaton f', that there is inconsistency in more than one object being represented by a same 'f', and that the Specifications does not seem to be consistent with this nomenclature, Applicants note that claim 1 has been amended to correct the typographical error.

Regarding the Examiner's assertion that claim 5 recites S', S(bar) and 'X' and only S and Q are explained leaving out S(bar) and 'X', Applicants note that the terms S(bar) and 'X' are terms well understood by persons of ordinary skill in the art.

Regarding the Examiner's assertion that claims 7-9 recite symbols for which only a few are provided with some definition and that claim 6 does not provide explanation of the symbols  $\langle a \rangle_{q_1}$  and of  $\delta(q, true)$  and of the 'V' symbol, Applicant notes that the cited symbols are well understood by persons of ordinary skill in the art of logic.

Regarding the Examiner's assertion that claims 10-11 recite an acronym for which there is no definition, Applicants note that the term "ATS" is a term well understood by persons of ordinary skill in the art.

#### Section 101 Rejections

Claims 1-26 were rejected under 35 U.S.C. §101 because the claimed invention is directed to non-statutory subject matter. In particular, the Examiner asserts that the end result (regarding claim 1) appears to be an abstract program having reduced states obtained from other abstract entities, and that an abstract program represented by computing state values cannot be perceived as tangible real-world data, absent any description or elaboration as to the manner in which these reduced states are contained, embodied as or persisted into. The Examiner further asserts that claim 1 amounts to generating abstract and unstable entities (states of a computing process being volatile) and is rejected for not sufficiently conveying that the result produced

belong to application level data in terms of a concrete, tangible, and useful result, as required by the Practical Application Test requirement. The Examiner rejected claims 1-13 for not reciting sufficient teaching to convey a Practical Application leading to a tangible result, and claims 14-26 for not providing further teaching as to creating a tangible useful set of outputs.

5           The Supreme Court has stated that the "[t]ransformation and reduction of an article 'to a different state or thing' is the clue to patentability of a process claim." *Gottshalk v Benson*, 409 U.S. 63, 70, 175 U.S.P.Q. (BNA) 676 (1972). In other words, claims that require some kind of transformation of subject matter, which has been held to include intangible subject matter, such as data or signals, that are representative of or constitute physical activity or objects  
10       have been held to comply with Section 101. *See, for example, In re Warmerdam*, 31 U.S.P.Q.2d (BNA) 1754, 1759 n.5 (Fed. Cir. 1994) or *In re Schrader*, 22 F.3d 290, 295, 30 U.S.P.Q.2d (BNA) 1455, 1459 n.12 (Fed. Cir. 1994).

          Thus, as expressly set forth in each of the independent claims, the claimed methods or system provide program reduction and transform a program into a reduced abstract  
15       program. This transformation to a reduced abstract program provides a useful, concrete and tangible result for testing and verifying the original program, as described in the Background section of the present disclosure.

          Applicant submits that each of the claims 1-26 are in full compliance with 35 U.S.C. §101, and accordingly, respectfully requests that the rejection under 35 U.S.C. §101 be  
20       withdrawn.

#### Independent Claims 1 and 14

          Independent claims 1 and 14 were rejected under 35 U.S.C. §102(b) as being anticipated by Alur et al. Regarding claim 1, the Examiner asserts that Alur teaches computing an abstract program with a reduced number of states and an altered version of said branching  
25       time property, f, using said product (e.g. reduction -- col. 9, lines 36-52; col. 10, lines 23-51; FIGS. 9 and 11; col. 11, line 47, to col. 12, line 22).

          Applicant notes that Alur is directed to an analysis of a hierarchical machine. Alur does *not*, however, address the issue of *reducing a program while preserving branching time properties*. Applicant also notes that the use of a product construction with an automaton

does *not* imply that program reduction is being performed. Independent claims 1 and 14 require computing an abstract program with a *reduced number of states* and an altered version of said branching time property, *f*, using said product.

Thus, Alur does not disclose or suggest computing an abstract program with a  
 5 reduced number of states and an altered version of said branching time property, *f*, using said product, as required by independent claims 1 and 14.

#### Additional Cited References

Alur2 was also cited by the Examiner for its disclosure of resolving branching temporal logics with quantification of paths.

10 Applicant notes that Alur2 teaches how to perform an evaluation of branching time properties on an original program. Alur2 does *not*, however, address the issue of reducing a program while preserving branching time properties.

Thus, Alur2 does not disclose or suggest computing an abstract program with a reduced number of states and an altered version of said branching time property, *f*, using said  
 15 product, as required by independent claims 1 and 14.

#### Dependent Claims 2-13 and 15-26

Dependent claims 2-11 and 15-24 were rejected under 35 U.S.C. §102(b) as being anticipated by Alur et al., and claims 12, 13, 25, and 26 were rejected under 35 U.S.C. §103(a) as being unpatentable over Alur et al., and further in view of Alur2.

20 Claims 2-13 and 15-26 are dependent on claims 1 and 14, respectively, and are therefore patentably distinguished over Alur and Alur2 (alone or in any combination) because of their dependency from amended independent claims 1 and 14 for the reasons set forth above, as well as other elements these claims add in combination to their base claim.

All of the pending claims, i.e., claims 1 through 26, are in condition for allowance  
 25 and such favorable action is earnestly solicited.

If any outstanding issues remain, or if the Examiner has any further suggestions for expediting allowance of this application, the Examiner is invited to contact the undersigned at the telephone number indicated below.

The Examiner's attention to this matter is appreciated

Respectfully submitted,

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Date: March 5, 2007



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